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USSR MEETING ON FOOT-AND-MOUTH DISEASE

Veterinariya
Moscow, Jul 1953

A. M. Dobrokhotoy, Scientific Secretary,
Veterinary Section, VASKhNIL

The following is the full text of Dobrokhotoy's account of the 39th Plenary Session, Veterinary Section of VASKhNIL.

From 20 to 22 April 1953, the Veterinary Section of VASKhNIL (All-Union Academy of Agricultural Sciences imeni Lenin) held its regularly scheduled 39th Plenary Session, which was devoted in this instance to problems connected with the struggle against and liquidation of the foot-and-mouth disease /aphthous fever, epizootic apthosis/ of farm animals. The work of the plenary session was directed by the deputy chairman of the Veterinary Section, VASKhNIL Academician S. N. Muromtsev.

Workers from veterinary scientific research institutions, practicing veterinary physicians, and officials from the veterinary divisions of several USSR oblasts, 200 persons in all, participated in the activities of the plenary session.

The plenary session heard and discussed more than 20 reports pertaining mainly to the peculiarities of the biology of the causative factor of foot-and-mouth disease, to the questions of specific prophylaxis and therapy of this disease, to the methods of general disinfection when the disease occurs, and, in particular, to the ways of disinfecting rawhides obtained from infected animals.

A. L. Skomorokhov (Ryazan' SKhI, Ryazan' Agricultural Institute) presented a general report on the subject, "Fundamental Questions Pertaining to the Prophylaxis and Liquidation of Foot-and-Mouth Disease." In line with the plan adopted at the 19th Party Congress aiming at a further significant increase of collective livestock together with a corresponding growth in its productivity, Professor Skomorokhov pointed out that one of the most important tasks in the field of animal husbandry is liquidation of certain extremely dangerous, contagious animal diseases, in particular the foot-and-mouth disease. He first dealt with questions concerning the epizootiology of the disease and the causes of its spread, and then concerning the importance of protective quarantines and veterinary sanitation measures. A distinctive feature of foot-and-mouth disease is its high degree of contagion and the presence in nature of a multitude of types and variations of types of the disease virus.

During the last 15-20 years, the struggle against this disease has been conducted on the basis of quarantine restrictions and organizational agricultural measures. Under this system, the standard operating procedure in benign cases of the disease was inoculation (super-infection) of adult cattle with the virus. These virus inoculations immediately brought on a comparatively mild illness in the animals affecting all animals simultaneously, and made it possible to shorten the period of quarantine restrictions during an actual onslaught of the disease in an acute form.

The application of specific biopreparations (vaccines and serums) may turn out to be of great help in the successful fight with foot-and-mouth disease. Of all the vaccines presently suggested as prophylactics for it, the one most deserving of attention, in Skomorokhov's opinion, is Formolaluminum hydroxide

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("deposited") vaccine, which has already been tested in practice. In combating the loss of young animals, antiaphthosis serums taken from hyperimmune and cured animals are of advantage. Skomorokhov proposed that the use of these biological preparations be expanded.

In concluding his report, Skomorokhov remarked that, although Soviet research in the field of foot-and-mouth disease has resolved many important questions about the scientific and practical aspects of this disease, scientific work on the subject, generally speaking, still lags behind practical requirements. In particular, there has been, as yet, no completely adequate study of the problems of the epizootiology of foot-and-mouth disease, of carriers of the virus, of causes of the emergence of malignant aphthosis, of aphthosis therapy, of disinfection, and so forth.

In order to provide the necessary organizational and scientific leadership to research work on epizootic aphthosis in the USSR, Professor Skomorokhov again proposed that the problem of the creation of a specialized scientific research institution for the study of aphthosis, similar to the former Foot-and-Mouth Disease Institute, and dedicated to the production of anti-aphthosis biopreparations, be brought to the attention of the responsible authorities.

Candidate of Veterinary Sciences, V. N. Gribov, (VIEV, All-Union Institute of Experimental Veterinary Science) presented a report on the epizootic significance of the multiple types of the foot-and-mouth disease virus and their variants. He noted that during the past few years in the USSR three fundamental types of the virus of foot-and-mouth disease have been identified. They are distinguishable from one another by their immunological features and are provisionally designated as types "O", "A", and "C." There are also variants of the type "A." The geographic occurrence of these types bears a localized character.

The variability of the virus and the appearance of new types are connected, in Gribov's opinion, with changes in external conditions and apparently depend on contact of the virus with an animal organism which has a certain degree of immunity to the foot-and-mouth disease. This situation has extremely great significance for the working out of specific methods of prophylaxis against the foot-and-mouth disease and requires a broad and systematic study of the types of aphthosis virus.

For the study and differentiation of these types, he proposes extensive use of a serological method, which he has worked out, for the investigation of the antigenic structure of the foot-and-mouth disease virus with the aid of the reaction of complement fixation.

Scientific Associate S. M. Filipovich from the Kazakh NIVI (Scientific Research Veterinary Institute) also reported on the variability of the foot-and-mouth disease virus. She, too, remarked upon the fact that the virus, in conjunction with a change in the conditions of its external environment, can alter its immunological properties.

As a result of practical observations, she surmises that the foot-and-mouth disease virus, having entered an immune animal organism during an epizootic outbreak, can undergo profound immunobiological changes and can cause a reinfection of the animal with foot-and-mouth-disease. This surmise was afterwards confirmed by her experimentally in the laboratory by passing the virus through immune animals.

Thus, in experiments on guinea pigs, the type "C" virus was changed twice into type "O," type "A" was changed into the "O" and "C" types, and a variant of type "O" into type "A." In experiments on cattle, type "O" foot-and-mouth disease virus and a variant of the type "A₂" were transformed into type "C."

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A great number of reports were devoted to the question of specific prophylaxis of the foot-and-mouth disease.

The Candidates of Veterinary Sciences L. S. Ratner and V. N. Gribanov (VIEV) reported on the results of practical utilization of the so-called antiaphthosis aluminum hydroxide VIEV vaccine developed by them. This vaccine was first proposed and tried out in 1948. In 1949-1952, its effectiveness has been verified by a number of veterinary scientific research institutions and practicing veterinarians who used it in field tests under widely varying conditions of extensive animal husbandry production.

At present, on the basis of the use of the vaccine on more than 300,000 head of cattle, Ratner and Gribanov have come to the following conclusions:

(1.) The antiaphthosis vaccine is harmless and is the only highly effective biological preparation today which prevents animals from contracting the foot-and-mouth disease.

(2.) With the help of this vaccine, it will be possible not only to guarantee the protection of individual animals, but to prevent, as well, the spread of the disease.

(3.) With the general use of this vaccine, in conjunction with other antiaphthosis measures, it may be possible to liquidate epizootic foot-and-mouth disease altogether.

Candidates of Veterinary Sciences S. I. Voynov and K. A. Arifdzhanov from the Uzbek NIVI also related the results of their experiences in using the antiaphthosis aluminum hydroxide VIEV vaccine of Ratner and Gribanov. They prepared the vaccine by the VIEV method from local strains and used it in a series of extensive experiments on farms threatened by foot-and-mouth disease. In separate instances, Voynov and Arifdzhanov applied the vaccine directly to imperiled herds of cattle and sheep, respectively. In all, they inoculated 67,288 head of cattle and about 40,000 sheep.

The cattle were given the vaccine once, subcutaneously, in the region of the neck, adult animals receiving a dose of 10 ml and young animals up to 6 months old, 5 ml. The inoculated animals retained their appetites in a full measure, and the milch cows did not show any reduction in the quantity of milk. From 90 to 95% of the animals were protected from natural infection. From 12 to 14 days after inoculation, immunity started and, in the cases observed, lasted 10-12 months.

A 5-ml dose of vaccine was given subcutaneously to 15,316 adult sheep, and a 1-ml dose intracutaneously to 24,095 sheep. The inoculated sheep had no complications. Immunity started in the subcutaneously inoculated sheep after 10-14 days, and in the intracutaneously inoculated, after 7-10 days. It lasted about a year.

The VIEV vaccine of Ratner and Gribanov was also given a high-positive evaluation by the other participants in the plenary session who took part in the discussions.

Candidate of Veterinary Sciences V. I. Kindyakov from the Kazakh NIVI reported on the use of the antiaphthosis aluminum hydroxide vaccine under production conditions in Kazakhstan.

In 1952, in order to carry out comparative tests, two varieties of the vaccine were prepared, one according to the VIEV method, and the other according to the Kazakh NIVI method, from local strains of the virus belonging to

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type "O." The first vaccine was administered subcutaneously in 5-10 ml doses, the second intracutaneously in 2-ml doses. Among the animals inoculated with the first variety, 54.14% came down with foot-and-mouth disease for various lengths of time and in various degrees, while 84.23% of the control animals, not inoculated at this time, contracted the disease. Among the animals inoculated with the second variety, 24.63% came down with various degrees of the disease, while 78% of the control animals contracted it.

On the basis of these data, Kindyakov came to the conclusion that it will be necessary to carry on further research on the improvement of the immunizing properties of the aluminum hydroxide vaccine.

Prof F. A. Terent'yev, of the former Scientific-Practical Veterinary Laboratory of the Ministry of Sovkhozes RSFSR, presented a report on the experimental inoculation of cattle with a virus which had been treated with formalin (formol-vaccine). He pointed out that many researchers had previously used the formalin-treated virus in the fight against the foot-and-mouth disease. In 1941, the People's Commissariat of Agriculture of the USSR published a manual on a method of preparing and using this vaccine. This method, however, turned out to have been insufficiently worked out, so that in practical experience with the formol-vaccine, both satisfactory and unsatisfactory results were obtained.

Taking this into consideration, Professor Terent'yev and Candidate of Veterinary Sciences Ye. P. Stefanova perfected a method for the preparation of an antiaphthosis formol-vaccine. They then used it for prophylactic purposes at a number of places which were unfavorable with respect to, or threatened with foot-and-mouth disease. Finally they came to the conclusion that the formol-vaccine does not induce foot-and-mouth disease in animals inoculated with it and is, in effect, a harmless preparation. It imparts a sufficiently persistent immunity and can be applied as a preventative measure to inoculate healthy animals.

Prof I. I. Kazanskiy and Candidate of Veterinary Sciences V. Ye. Karneyeva (VIEV) reported on experiments with a foot-and-mouth disease virus which had been attenuated (inactivated) by treatment with ASD A. V. Dorogov's Antiseptic Serum.

From their reports, it was clear that during the period from 1949 to 1952 the Chemotherapy Division of VIEV conducted extensive experiments on the action of various chemical substances on viruses and bacteriophages. In all, 232 compounds were tested. The nature of their [virus-] inactivating effect was thereby determined to a large extent, as was the possibility of reactivating viruses and bacteriophages by various methods.

The most interesting of the investigated materials was A. V. Dorogov's ASD Fraction 2, which inactivates the foot-and-mouth disease virus. In order to ascertain the degree of inactivation to which a virus treated with the ASD preparation is subjected, experiments were carried out on farms threatened by the foot-and-mouth disease. These experiments showed that a slightly or weakly inactivated virus did not deter the outbreak of foot-and-mouth disease, but hastened the clinical appearance of the disease in latently ill animals and incubates, bringing about a simultaneous, but less severe, infection of the other animals.

A virus which had undergone a more extended period of inactivation did not provoke the disease, and was used, therefore, as a prophylactic to inoculate cattle, sheep, and goats in places threatened by the disease. This virus has been provisionally named K-VIEV vaccine.

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The preliminary results of an extensive test of the K-VIEV vaccine in various geographic zones on more than 500,000 animals permit us to draw the following conclusions:

- (1) The K-VIEV vaccine is harmless and does not provoke foot-and-mouth disease in inoculated healthy animals (cattle, sheep, and goats).
- (2) The inoculation of threatened herds with the K-VIEV vaccine, in conjunction with other measures, made it possible to protect on the average 90-95% of the inoculated cattle from coming down with the disease.
- (3) Only 0.2% of the vaccinated sheep and goats contracted natural foot-and-mouth disease. Experiments on swine gave good results after a double inoculation.
- (4) Experiments on calves, as well as on adult cattle, showed that the immunity was not always constant or enduring.
- (5) In isolated herds and regions, immunization with the K-VIEV vaccine did not afford lasting results, and it will therefore be necessary to do further research on improving the quality of the vaccine and on an analysis of its effectiveness.

Professors V. A. Nikolayev and P. A. Tsion of the Leningrad NIVI, A. I. Trumm, the director of the Leningrad Swine-Raising Trust, L. Yanov from the Tartu Serum Laboratory, Romanchenko (Chief of the Veterinary Division of Tula Oblast), and others took part in the discussion of this report.

Doctor of Biological Sciences M. I. Mikheyev (VIEV) in his report, "Complex Biochemical Protein Compounds and Their Significance in Foot-and-Mouth Disease," apprised the plenary session of work being done on the inactivation of the foot-and-mouth disease virus in a protein medium. The inactivation proceeds as a result of the formation of so-called protein-virus complexes, some of which possess the ability to bring about immunity in animals while others, on the contrary, cause sensitization of the organism. Experiments on cattle conducted with immunogenic protein complexes by Mikheyev gave positive results.

The most extensive experiments in the investigation of the protein-virus complex were conducted by S. G. Poplaukhin of the Altay VOS (Veterinary Experimental Station) under production conditions when foot-and-mouth disease was present.

He stated that as a result of inoculation with the protein-virus complex he succeeded in ridding one farm of the infection and creating an immunity in the cattle. In suckling calves, the preparation produced immunity for 3-4 months. This method of inoculation against foot-and-mouth disease is of great practical significance, since the protein-virus complex can be prepared right on the farms themselves.

Candidate of Veterinary Sciences A. A. Sviridov, from the Novosibirsk VOS, gave a report on the inoculation of cattle with a foot-and-mouth disease virus which had been passed through guinea pigs. He obtained an antiaphthosis vaccine of this type from a local strain of cattle virus which had been adapted by numerous passages through guinea pigs.

It was established that, as a result of Sviridov's experiments, a pronounced immunity was developed. This was confirmed by the [attempted] artificial infection of the inoculated animals after 15-20 days with a local field foot-and-mouth disease virus, and by the insusceptibility of the inoculated animals, under unfavorable conditions, to natural infection with the foot-and-mouth disease virus.

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He remarked that the present technological processes used in the Soviet meat combines for the treatment of large quantities of very valuable products guarantee that these products will be manufactured in a manner which is completely safe from the point of view of veterinary sanitation. He then offered a new system for the veterinary sanitation evaluation of raw animal products derived from animals inflicted with the foot-and-mouth disease.

The plenary session in its decisions declared that the specific inoculation of animals upon the appearance of foot-and-mouth disease is merely a supplementary measure which increases the effectiveness of other measures taken against the disease.

On the basis of the evidence accumulated in the struggle against foot-and-mouth disease, the plenary session considered that the strictest observance of quarantine regulations and of veterinary sanitation measures, in conjunction with the other measures specified in the instruction on the foot-and-mouth disease, is fundamental and essential under epizootic conditions. These measures should be carried out in strict compliance with the Veterinary Code of the USSR.

The plenary session recommended that the relevant official instruction now in force be re-examined, taking into account the accumulated practical experience and the achievements of science.

The plenary session proposed that the scientific research institutions occupied with the problems connected with the fight against foot-and-mouth disease give increased attention to the study of the biology and mutability of the virus of this disease; to the cultivation of the virus; to the study of the epizootiology, pathogenesis, immunogenesis, and therapy of this disease; to the discovery of new methods of isolating the foot-and-mouth disease virus for the preparation of serums and vaccines; and, finally, to the discovery of more effective methods and means of disinfection when the foot-and-mouth disease occurs.

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